



# FUTURE OF SRI LANKA

TO BE POWERED BY

# SOLAR ENERGY





## **Sri Lanka Institute of Marketing**

#94, Ananda Rajakaruna Mawatha,  
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All queries should be addressed to [srb@slim.lk](mailto:srb@slim.lk)

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# **FUTURE OF SRI LANKA TO BE POWERED BY SOLAR ENERGY**



# Acknowledgment

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- **Mr. Rumesh Jayasekara**  
Marketing Manager  
St. Anthony's Hardware (Pvt) Ltd
- **Mr. Damith H. Dedigamuwa**  
Manager - Group Sales  
Macksons Holdings

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# Message from the President

**Mr. Chinthaka Perera**

President

Sri Lanka Institute of Marketing, 2023/24



## Harnessing Solar Power: Sri Lanka's Path to a Sustainable Future

Sri Lanka, a tropical island country endowed with year-round sunshine, has realized the enormous potential of solar energy as a sustainable and clean source of energy. The Sri Lanka Institute of Marketing (SLIM) has actively promoted the use of solar electricity throughout the country. We shall examine the value of solar energy for Sri Lanka in this post, as well as how SLIM is pushing for the adoption of this clean energy source.

Solar power has the capacity to empower local communities in Sri Lanka. With solar energy systems, remote and underprivileged areas that are off the traditional power grid can have access to electricity. This inclusion has the potential to improve the standard of living, enhance education, and stimulate economic activities in these regions.

As the leading marketing institute in Sri Lanka, the Sri Lanka Institute of Marketing recognizes the importance of sustainable development and has

taken a proactive approach to promoting solar power usage. Through awareness campaigns, workshops, and collaborations with key stakeholders, SLIM has been instrumental in disseminating knowledge about solar energy benefits and facilitating its adoption. By educating businesses, government organizations, and the general public about the advantages of solar power, SLIM aims to drive a paradigm shift toward clean energy solutions.

Solar power holds immense importance for Sri Lanka's sustainable future. The country's abundant sunlight resources, coupled with the economic, environmental, and social benefits of solar energy, make it a compelling choice for Sri Lanka's energy needs. As the Sri Lanka Institute of Marketing (SLIM), we are committed to embracing solar power and empowering the nation through renewable energy adoption. By harnessing the power of the sun, Sri Lanka can pave the way towards a greener, more prosperous future for all its citizens.

# Message from the Vice President – Education & Research

## Prof. (Dr.) Dewasiri N. Jayantha

Professor  
Faculty of Management Studies  
Sabaragamuwa University of Sri Lanka

Vice President- Education & Research (2023-2024)  
Sri Lanka Institute of Marketing

Brand Ambassador - Emerald Publishing, South Asia



Solar energy is indeed considered one of the most promising sources of renewable energy and is widely regarded as a key component of the transition to a more sustainable and environmentally friendly future. Solar energy is renewable, meaning it relies on an abundant and virtually inexhaustible resource—the sun. Unlike fossil fuels, solar energy production does not deplete natural resources or release harmful greenhouse gases that contribute to climate change. Solar power systems generate electricity through photovoltaic (PV) panels or concentrated solar power (CSP) plants, producing clean energy without polluting the air, land, or water.

The sun is an abundant energy source, providing more energy to the Earth's surface in one hour than the world consumes in a year. Solar energy is available virtually everywhere, making it accessible to both urban and remote areas. Even in regions with less sunlight, solar power can still be harnessed effectively, thanks to advancements in technology. The cost of solar energy has experienced a significant decline over the past decade. Technological advancements, economies of scale, and increased manufacturing efficiency have all contributed to the decreasing costs of solar panels and installation. This trend has made solar energy increasingly competitive with traditional fossil fuel-based energy sources, and in some regions, solar power is already cheaper than conventional electricity.

The solar industry has emerged as a major job creator. As the adoption of solar energy increases, more jobs are being created in manufacturing, installation, maintenance, and research and development. The growth of the solar industry also stimulates local economies and provides opportunities for entrepreneurship and investment. Solar energy reduces dependence on fossil fuels, mitigating the risks associated with their price volatility and geopolitical conflicts. Countries with abundant solar resources can harness this energy domestically, promoting energy independence and reducing the need for importing energy from other nations.

Solar energy systems can be designed to fit a wide range of scales, from small residential installations to large-scale solar farms. This scalability allows for flexibility in meeting different energy demands, whether at the individual, community, or national level. Additionally, solar installations can be expanded incrementally, allowing for modular growth as energy needs increase. Solar energy is particularly beneficial for off-grid areas or regions with unreliable access to centralized power grids. It enables the provision of electricity in remote locations, powering schools, hospitals, and communities that would otherwise lack access to electricity. Solar-powered devices, such as solar lanterns and solar water pumps, are also transforming the lives of people in developing regions, improving education, health-care, and productivity.

While solar energy offers numerous advantages, challenges remain, such as intermittency (since sunlight availability varies), energy storage, and grid integration. However, ongoing research and development efforts are addressing these concerns and driving the adoption of solar energy alongside complementary technologies.

Solar Energy in Sri Lanka has a significant potential, according to research conducted occasionally by

SLIM Research Bureau on a variety of markets. This magazine consisted of ten articles enlightening implications of solar technology for all the stakeholders. SLIM Research Bureau and SLIM as the national institution for marketing in Sri Lanka believe it is the responsibility of the institute to draw attention to the community of this potential market. Solar Energy, in my opinion, might be employed at this time as a fresh strategy for generating power for the country as a sustainable solution.



# Message from the Chief Executive Officer

## Mr. Sanath Senanayake

Chief Executive Officer/Executive Director  
Sri Lanka Institute of Marketing



The Sri Lankan solar power market has experienced a significant growth and development in recent years, establishing itself as a promising sector for renewable energy. With abundant sunshine throughout the year, Sri Lanka has a vast potential for solar energy generation.

One of the key drivers behind the growth of solar power in Sri Lanka is the government's commitment to renewable energy. The Sri Lankan government has implemented various policies and incentives to encourage the adoption of solar energy, including feed-in tariffs and net metering schemes. These initiatives have attracted investments from both domestic and international players, fostering the development of the solar power market.

The commercial and industrial sectors in Sri Lanka have been early adopters of solar power systems, recognizing the long-term benefits of reducing energy costs and carbon footprints. Additionally, residential consumers are increasingly embracing solar energy solutions, driven by rising electricity prices and a growing awareness of environmental sustainability.

The Sri Lankan solar power market also benefits from technological advancements however the depreciation of the Sri Lankan rupee consequently the rising cost of installation has been a set-back for domestic installations. Considerably a long term pay-back and challenges such as grid integration regulatory barriers have somewhat delayed the adaptation by the Sri Lankan consumers. The government and industry stakeholders are working together to address these challenges and create a conducive environment for solar power expansion.

Nevertheless, to support the growth of the solar power market, the Sri Lankan government has encouraged the establishment of solar power projects, both large-scale and small-scale. This has resulted in the development of solar farms, rooftop installations, and community-based solar initiatives. Overall, the Sri Lankan solar power market holds a great potential for further growth and development. With its favorable solar resources, supportive government policies, and increasing consumer demand, the country is well-positioned to harness the power of the sun and transition towards a cleaner and more sustainable energy led future.

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# Sri Lanka, A Hub For Renewable Energy Generation

The very first city in the world to be lit with electricity was Bristol in England and it took place on 26th June 1881. In 1882, Ceylon, which was a colony of Britain, was able to witness electricity from the ship SS Helios which sailed into Colombo harbor.

The chronology of the events continued in the following manner; In 1890, the first electric bulb was lit with electricity in Ceylon, at the Billiard room in Bristol Hotel, Colombo Fort with the power generated by a diesel generator. In 1895, M/S Boustead Bros. made Sri Lanka's first public electricity supply available in Colombo.

In 1918, engineer D. J. Wimalasurendra, identified the hydro-power potential in the central hills of Sri Lanka through research. On **01st November 1969**, Ceylon Electricity Board was established under **Parliament Act No. 17 of 1969**.

In the present context, the world is going green and renewable energy plays vital role. Providing low-cost electricity with renewable energy sources hence has become predominant. Renewable energy resources include; biomass, geothermal energy, hydropower, wind energy and solar energy. They are naturally replenished in a short period of time.

Renewable energy resources and fossil fuel reserves found within our country are referred to as indigenous resources. Sri Lanka could comply with the triple bottom-line and also enhance the GDP by harnessing these natural resources which are in abundance, and thereby generating cost effective renewable energy.

The main renewable energy resources available in Sri Lanka are; Biomass, Hydropower, Wind and Solar. These environmental friendly renewable energy sources keep global warming at bay. Fossil fuel being a non-renewable energy source tend to leave the environment with hazardous remains and carbon dioxide thus we cannot put our planet in a sweatbox by harping forever on fossil fuel.

Sri Lanka being an island situated near the equator, is blessed with a significant amount of Solar Radiation or Sunlight year around. Looking at this fact and the rapid development of solar technology in the world, experts claim that solar power generation would be Sri Lanka's best option in achieving its goals in low carbon electricity generation and providing low-cost electricity to the people to meet the growing demand.

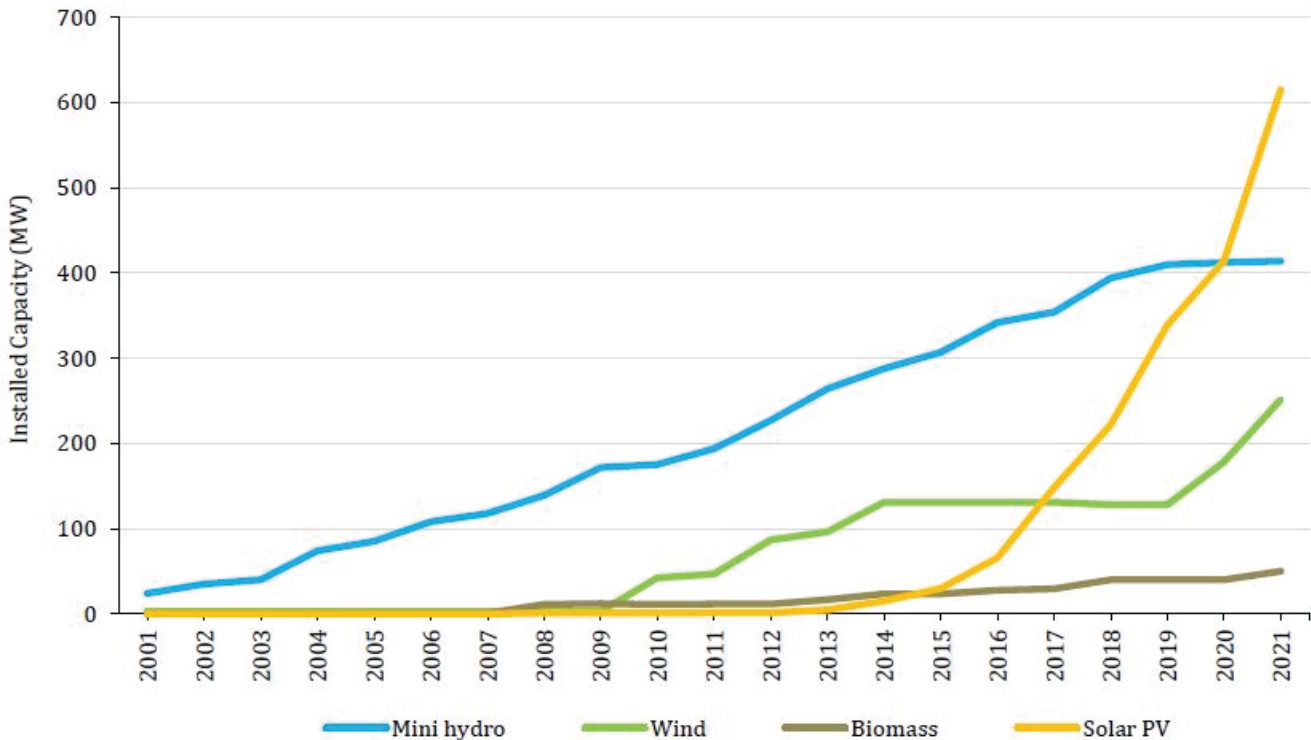
Indigenous Energy Source	Typical User Groups	Typical Applications
Solar Power	Solar photovoltaic	Rooftop systems
	Solar photovoltaic	Household lighting
	Grid connected PV	For sale to utility
	Solar Thermal	Hot water systems in commercial and domestic sectors
	Informal use	Household and agricultural use



# Composition of Total Installed Capacity of the System by December 2021

Ownership	Plant Type	Capacity (MW)
CEB	Major Hydro	1,383
	Thermal	1,554
	Renewables (Except Major Hydro)	103
Independent Power Producers (IPP)	Thermal	434
	Renewables	710

## Other Renewable installed Capacity by source 2001-2021



# Electricity Demand: Past and the Forecast

## Past Demand

Demand for electricity in the country during the last fifteen years has been growing at an average rate of about 4.4% per annum while peak demand has been growing at a rate of 3% per annum as shown in Table 3.1. The peak demand has grown at a rate of 2.7% during the last 5 years and energy demand has been growing at a rate of 3.2% per annum.

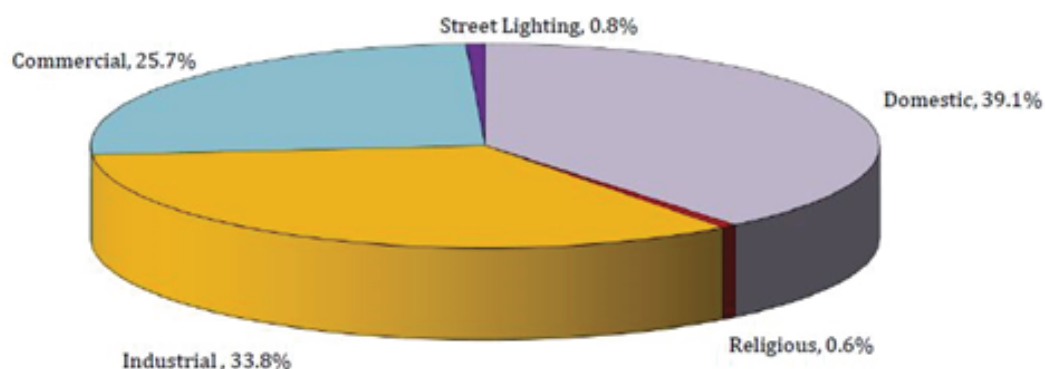
Electricity consumption of Sri Lanka has declined drastically after the national lockdown was enacted in March 2020 due to the COVID-19 pandemic situation. It is observed the demand in 2020 has contracted by 2.2% compared to 2019. However, in 2021 electricity consumption increased by 6.5% and returned to pre-pandemic level mainly due to easing of lockdown curbs.

Recovery in electricity demand and consumption in 2021 is mainly due to the surge in economic activities amid easing of lockdown restrictions. Monthly electricity consumption shows positive growth rates in latter part of the year 2021 compared to 2020. In 2021, net electricity generated to meet the demand amounted to 16,716 GWh (including rooftop solar energy contribution), which had been 15,714 GWh in 2020 with 6.4% growth rate and 11,725 GWh ten years ago (in 2012). The recorded maximum demand within the year 2021 was 2,802 MW, which was 2,717 MW in year 2020 and 2146 MW ten years ago (in 2012).

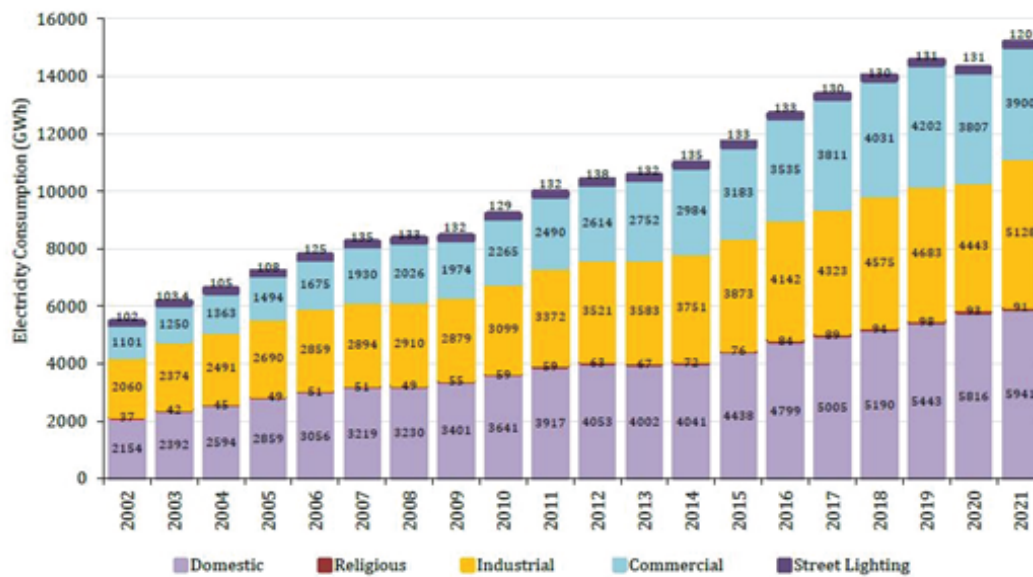
Electricity Demand in Sri Lanka, 2007– 2021

Year	Energy Sales (GWh)	Avg. Growth (%)
2007	8,276	5.7
2008	8,417	1.7
2009	8,441	0.3
2010	9,268	9.8
2011	10,024	8.2
2012	10,474	4.5
2013	10,624	1.4
2014	11,063	4.1
2015	11,786	6.5
2016	12,785	8.5
2017	13,431	5.1
2018	14,091	4.9
2019	14,611	3.7
2020	14,286	-2.2
2021	15,214	6.5

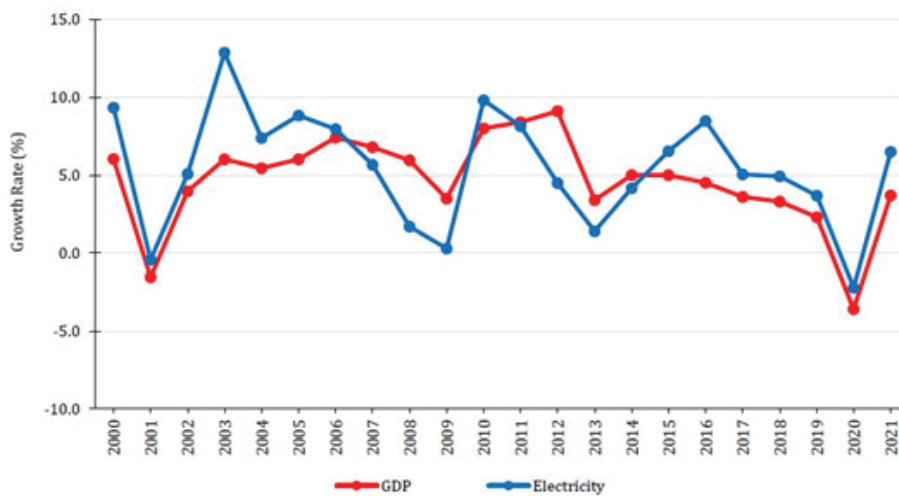
## Sectorial Consumption of Electricity (2021)



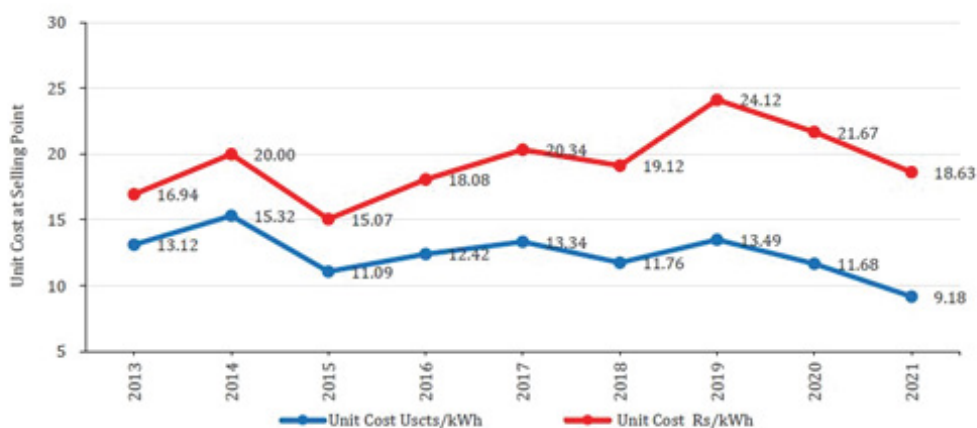
## Yearly Sectoral Consumption of Electricity (2002-2021)



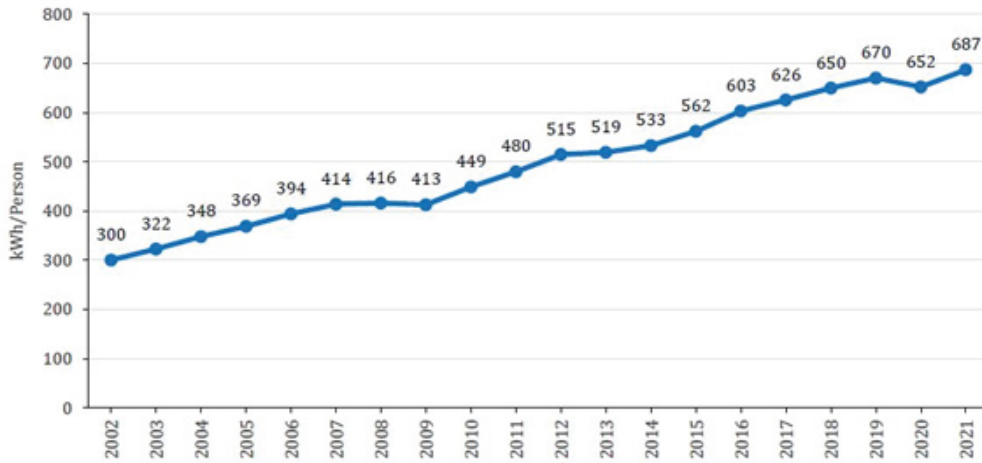
## Yearly Growth Rate of Electricity Demand and Growth Rate of the Country's Economy (2000-2021)



## Unit Cost of Electricity (2013-2021)



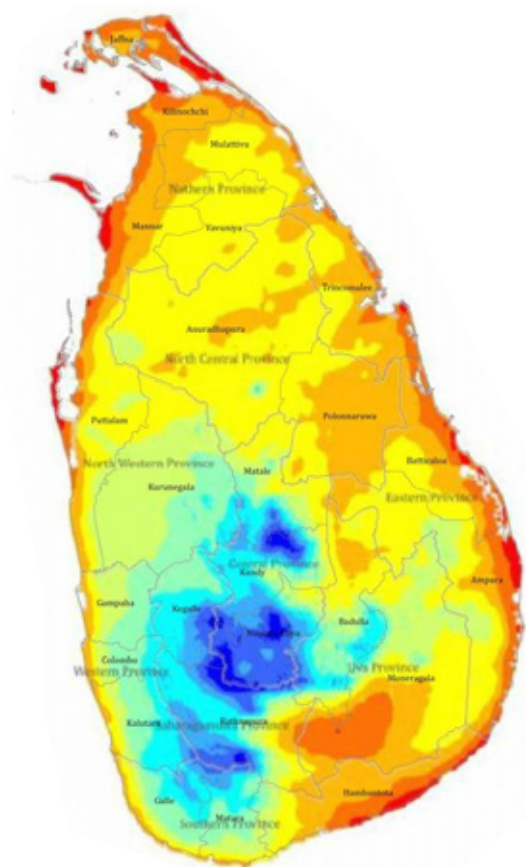
## Sri Lanka Per Capita Electricity Consumption



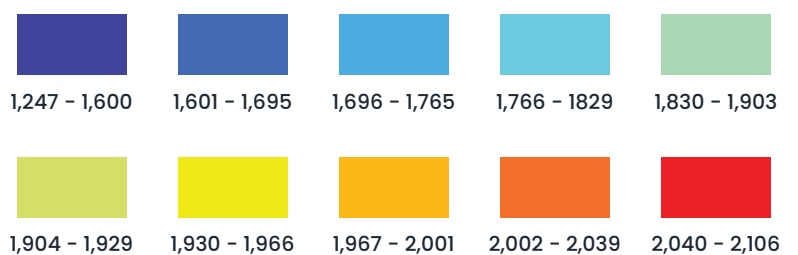
## Base Demand Forecast 2023-2047

Year	Demand	
	(GWh)	Growth Rate (%)
2023	16,741	6.4
2024	17,705	5.8
2025	18,725	5.8
2026	19,854	6.0
2027	21,124	6.4
2028	22,419	6.1
2029	23,794	6.1
2030	25,253	6.1
2031	26,801	6.1
2032	28,165	5.1
2033	29,601	5.1
2034	31,099	5.1
2035	32,646	5.0
2036	34,241	4.9
2037	35,879	4.8
2038	37,547	4.6
2039	39,253	4.5
2040	41,002	4.5
2041	42,777	4.3
2042	44,584	4.2
2043	46,431	4.1
2044	48,321	4.1
2045	50,259	4.0
2046	52,248	4.0
2047	54,315	4.0

## Solar Energy Resource Map of Sri Lanka



### GHI (kWh/m2)



Year	Renewable Capacity & Grid Scale Energy Storage Capacity Additions and Retirements	
2022	Uma Oya Hydropower Plant	120 MW
	Distribution Connected Embedded Solar	160 MW
	Grid Connected Partially Facilitated Solar	94 MW
	Mini Hydro	20 MW
	Biomass	10 MW
2023	Distribution Connected Embedded Solar	160 MW
	Grid Connected Partially Facilitated Solar	147 MW
	Wind	25 MW
	Mini Hydro	20 MW
	Biomass	20 MW
2024	Moragolla Hydropower Plant	31 MW
	Distribution Connected Embedded Solar	160 MW
	Grid Connected Partially Facilitated Solar	223 MW
	Grid Connected Fully Facilitated Solar	100 MW
	Wind	25 MW
	Mini Hydro	20 MW
	Biomass	20 MW
	Standalone Battery Energy Storage	20 MW / 50 MWh
2025	Distribution Connected Embedded Solar	200 MW
	Grid Connected Partially Facilitated Solar	20 MW
	Grid Connected Fully Facilitated Solar	300 MW
	(With Battery Energy Storage)	125 MW / 500 MWh
	Wind	150 MW
	Biomass	10 MW
	Standalone Battery Energy Storage	150 MW / 600 MWh

Source: Ceylon Electricity Board (CEB)





# Sustainable Energy Authority (SEA) Pours Its Heart Out

Sustainable Energy Authority (SEA) is mandated to promote renewable energy within Sri Lanka and it is the responsible Government focal point to develop renewable energy in the country. Registrations and regulations related to solar electricity service companies are under the purview of SEA. The connection of solar electricity systems to the national grid is only possible through registered companies under SEA.

Renewable energy sources; hydro, wind, solar and biomass are being successfully used in the country. The significance of RE is its ability to regenerate in the short run. Out of all RE sources, solar stands tall because it doesn't need specific locations to be resource-proven like hydro or wind. Since our country is closer to the equator, we have solar resources in abundance in majority of the locations and thus we must get maximum benefits from this.

“SEA introduced the ‘Net metering’ system to the country in 2011 and it paid dividends. In earlier days, the ‘Net metering’ scheme benefited about 3% of the electricity consumers who consumed high energy, with hefty bills. ‘Soorya Bala Sangramaya’ was launched in 2016 with the view of incorporating the missing market segment of the remaining 97% to fit into different tariff categories. Up to then, payments

were not involved for additional energy generation. With the introduction of ‘Net Accounting’ and ‘Net Plus’ schemes, micropower producers of solar electricity were able to obtain a monetary value for the additional electricity they generate. This made solar energy a fruitful investment to middle class people having moderate electricity bills. A new system is in the offing which is called, ‘Net Plus Plus’ from recent days.

“By the end of 2014, about 2,000 systems of 20 MW have been grid connected as rooftop solar PV systems, combining with about 60 solar service provider companies. By the end 2018, 18,000 systems have been connected to the grid with an installed capacity of 166 MW. By now (in 2023), over 47,000 customers are having solar rooftop systems installed. In 2017-18 there were loan schemes beneficial for consumers thus significant growth was shown. We introduced these loan schemes in collaboration with an Asian Development Bank-funded project for the convenience of potential customers. The customers are guided to consider the finances involved and their consumptions and select a system that is more beneficial and economical for them. However, at the moment these loan schemes are not in place.”



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SEA works towards bequeathing the consumer with a good product and a sustainable service since this is a long-term investment for the latter. Since this involves direct current (DC), the risk factor is high. Therefore, we make sure the products that go to the consumers are not prone to fire and electrical hazards. There are 410 registered companies as of today. To handle complaints, the Consumer Affairs Authority has teamed up with the SEA. We even go to the extent of blacklisting companies in adverse situations.”

“With the development of solar technology in the world, International Electrotechnical Commission (IEC) introduced standards to solar with ‘hybrid storage’. Since solar is usually used in daytime, criticism was ignited locally. To counter this, we have introduced the hybrid-solar systems. Hybrid inverters can store additional power in the daytime that can be used in the night.”

Along with ‘Soorya Bala Sangramaya’ program, SEA in association with SLSI introduced 22 standards to the grid-connected fraternity. These standards apply to the panels and to all other components of the unit including the cable that is compatible with the panel. All control elements are on the Grid connected solar installations but the off-grid ones are not highly regulated.

Even with the impact on economy from the dollar crisis and tariffs imposed, around 7% of the grid electricity generation is from solar energy at present. Solar panels have a warranty of 25 years while inverters have a 10-year warranty. To realize this long warranty period, the solar company has to provide its services constantly throughout this period. In certain instances, some companies go for closure within this period. In such situations, we guide the consumer to directly get in touch with the principal supplier.

Registration procedures of new suppliers are done under stringent checks and SEA teams up with the Public Utilities Commission of Sri Lanka (PUCSL), Consumer Affairs Authority, Telecommunications Regulatory Commission, LECO and CEB for this purpose.



Human resources thus are a major factor in this business. At present, the workforce strength of the solar energy sector is 1,205 engineers, 3,450 technicians, and 5,400 non-technicians. The skill upgrade of the sector was a great challenge. We started formally training the human resource of the sector from 2017. SEA also got directly involved in providing necessary training on the subject to CEB/LECO officials who visit installation sites for inspection and officials from banks since they need the knowledge to evaluate the financial performance of the projects. To add more value and recognition to training programs, we thought of absorbing the workforce into the NAITA-NVQ framework. For this purpose, we prepared RPL (Recognition of Prior Learning) schemes and appointed assessors to formally train and qualify such personnel to suit the modern-day job market. In conjunction with this, some companies did in-house training programmes. Therefore, SEA considers it a huge achievement to be able to develop the human resources of the country.

The 'Hambantota Energy Park' was established in 2011 with a view to attracting solar investors to the country. Japanese and Korean grants supported this initiative to materialize. Educating and training interested parties on solar is the main focus. Trainings are

conducted by SEA in association with the Public Utilities Commission of Sri Lanka. Around 50 persons can be trained at a particular session. Diverse solar technologies, solar panels, batteries, solar roofs that came to being in different periods could be witnessed here. The park consists of a separate demonstration of solar rooftops, battery storage systems, hot water systems and all sorts of equipment. Even the school children and nonprofessionals could visit here and witness the chronological development of solar technology in the world. Since 2011, electricity is provided to the National Grid from this energy park. This is the only renewable energy demonstration park in the country.

"There are many things you need to consider in selecting a suitable solar service provider company. Some target-bound salespersons might provide misleading information, such as over-statement of returns, quoting far below the industry average cost (sacrificing quality), misinforming on the inverters'/panels' country of origin, in such wise. In an instance that you sacrifice quality over price, you might end up having a system with low returns in the long run or ending up in courts suing an irresponsible service provider."



Hence It is highly recommended that you select solar energy service providers with following characteristics;

- Refrain from unnecessary competition and exaggerated returns
- Conduct a site assessment to see the practical conditions of the site and household energy consumption, prior to providing quotations for a system
- Use technically competent staff, equipped with hands-on experience, knowledge and training having high moral standards
- Elicit information about their past customers
- Stay up to date with the technology, regulations and standards
- Provide you with energy generation estimates with the underlying assumptions, and calculate a reasonable timeframe for payback and evaluate the Return on Investment (ROI)
- Provide installers with an insurance cover by the company
- Involve in ethical marketing practices only
- Offer a system warranty of more than three years and offer free maintenance agreement for at least two years
- Spends time with you to explain the essential technical components, warranty certificates, terms and conditions and such and listens to your queries and concerns.

“Although many solar electricity service providers are out there, some companies may not last long. When you go to a shop to buy a shoe, I’m sure you spend a reasonable time to assess the value (tangible and emotional benefits) and aesthetics of it. If so,



why hesitate to inquire about your long-term investment? Inquire from at least five companies before you jump into a conclusion. Bear in mind, that it is not the lowest quotation per KW that you should go for. It is the return you get for your money and the quality of the service they provide.

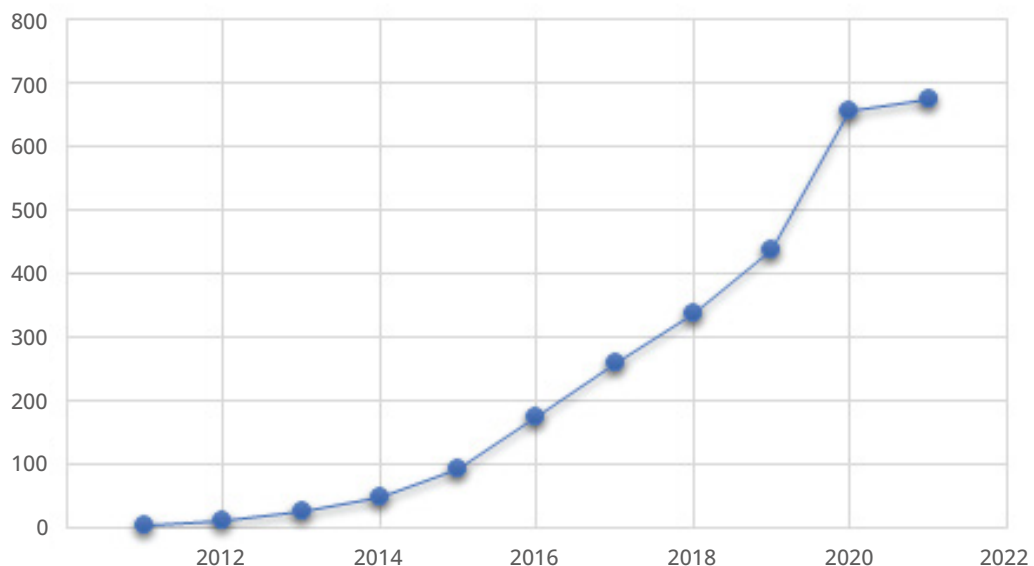
Make sure the online monitoring system is activated and accessible. It is smart and fun to look at it every day, like nourishing a baby. Regular inspection of the system would imply any problems and downtimes, enabling you to rectify it as soon as possible.

Even though solar electricity systems require very little maintenance, obviously they are not ‘fix and forget’ kind of stuff. It is safe and economical that you enter into maintenance agreements to perform the scheduled and unscheduled maintenance tasks.” I invite you all to be a part of this revolution and enjoy its benefits. Should you have any queries kindly email to [sea.bfse@gmail.com](mailto:sea.bfse@gmail.com) or visit us at No. 72, Ananda Coomaraswamy Mw. Colombo 07.

## Growth of Rooftop Solar PV - CEB and LECO

Year	No of Consumers	Capacity (MW)	Year - Growth
2013	550	3.35	3.35
2014	2201	13.30	9.95
2015	4196	26.00	12.70
2016	7108	50.42	24.42
2017	10389	93.72	43.30
2018	19164	176.37	82.65
2019	25712	261.37	85.00
2020	31165	337.87	76.50
2021	34318	439.00	101.13
2022	45801	655.00	216.00
		<b>Total</b>	<b>655.00</b>

## Growth of PV Capacity



	Net Metering		Net Accounting		Net Plus		Total	
	Consumers	Capacity (kW)	Consumers	Capacity (kW)	Consumers	Capacity (kW)	Consumers	Capacity (kW)
CEB	10,419	73,980	20,766	187,543	2,713	269,293	33,898	530,816
Leco	4,032	30,751	7,410	61,470	461	32,399	11,903	124,620
Total	14,451	104,731	28,176	249,013	3,174	301,692	45,801	655,436

Solar PV Service Provider Company (March. of 2022)	Total No of Staff - Engineers	Total No of Staff - Technicians	Total no of Non-Technical Staff	Total
388	1270	3550	5480	10300



## Ravini Karunaratne

Assistant Director (Engineering)  
Sri Lanka Sustainable Energy Authority



## Solar Photovoltaic System Technician (NVQ IV)

Demand for solar power has paved the way for demand for solar installers in the country. The solar industry is young and growing. Solar technicians can compete in the market with qualifications from a

recognized body along with the field experience they have gained while carrying out their work. The qualifications will assist them to expand their business while providing employment to others.

### Course Duration:

1 ½ years (Institutional Training and On The job Training in solar site)

### Content:

- Assess Site for Photovoltaic System Installation
- Organize Installing of Solar Photovoltaic Systems
- Install Solar Photovoltaic Systems
- Assist Commissioning of Solar Energy System
- Perform Operation and Maintenance of Solar PV Systems
- Arrange Small Scale Solar PV Systems
- Service and Maintain Solar PV Systems
- Practice Workplace Communication and Interpersonal Relations
- Apply Occupational Literacy and Numeracy
- Work in Teams
- Practice Occupational Health and Safety Procedures in a Workplace





### Available Districts :

- |                |                   |               |
|----------------|-------------------|---------------|
| 1. Colombo     | 4. Nuwara - Eliya | 7. Galle      |
| 2. Hambanthota | 5. Kurunegala     | 8. Rathnapura |
| 3. Matara      | 6. Puttalam       |               |

### Month of Enrollment :

March and July – 20 trainees per batch

### Course Fee :

Registration fee Rs. 1,000

### For more Details:

National Apprentice and Industrial Training Authority  
No . 971, Sri jayawardhanapura Mawatha,  
Welikada, Rajagiriya  
Tel No: 011-2888782 -5



### M L Priyantha

Assistant Director  
Marketing & Career Guidance Unit  
National Apprentice and Industrial Training  
Authority (NAITA)



# Installation of a Power-generating Solar System

## Background

The unexpected and exorbitant increase in the electricity bill in the recent past, presented me to have a solar power generating system installed as soon as possible. I did not have to exert much in selecting a reliable knowledgeable and well-experienced contractor since a close relation of mine introduced to me a service provider who took care of installing a solar power generating system at his residence a few years ago.

According to the introduction given the contractor had well over 20 years of experience in the solar industry and had been working together with the well-known first solar company in Sri Lanka until he established his private business in 2017.

The estimated cost of the project was Rs. 1.2 million.

## Advantages / Disadvantages

In spite of the intention, I had to have a 5kw power generating system installed, I was informed by the service provider that the relevant authority (CEB) has provided a 3kw system only depending on the capacity of the electricity power distributing transformers installed in our area.

Consequently, 3 kw power generating system was installed and the system plan followed was a solar net accounting system. Accounting for this system the electricity produced by the solar system during day time could be utilized by the consumer and the excess if any could be given to CEB.

If the consumer will be paid at the rate of Rs. 22/= per unit during the first 7 years only and from the 8th year it will be reduced to Rs. 15.50 for the electricity, fed (exports) to the utility grid.

If the consumption (Imports) is greater than what is fed (Exports) to the utility grid the consumer has to pay for the difference in terms of the existing electricity tariff imposed by the CEB. However, the electricity generated by the solar system cannot be utilized by the consumer during a power cut.

Further, the electricity generated cannot be fed to the utility grid too resulting in the wastage of power generated by the solar system during a power cut. This is a significant disadvantage from the consumer's point of view. The trip switch fixed to secure the inverter from damages caused by lightning, functions very often due to heavy lightning resulting in the stoppage of the whole system.



Neither an SMS alert system nor any other way of alarming the consumer about such a breakdown has been set up. Although the consumer is exempted from payment for the electricity utilized when his exports are in excess of the "Fixed Charge" and the government taxes/levy falls due for payment.

An after-sales service, i.e., free maintenance for a period of 12 months backed by warranty as stated below has been made available.

## Profitability

The profitability of the whole project would depend on the ability to arrive at the breakeven point within a reasonable period of time or at least within the warranty period.

E.g., My electricity bill is around Rs.12,000/= and the average income from the member of units produced (exports) is around Rs. 3,300 per month. Hence the total amount that could be saved for a month is Rs. 15,300/= and it would take nearly 6.5 years to cover the initial investment made. (1.2 Mn / 15,300/=).

On the other hand, if the cost of the project (Rs. 1.2 Mn) is deposited in a bank the monthly interest that could be earned at present is around Rs.14,000/=

## Risks

Inapplicability of the system warranty to cover damages caused to the electrical appliances installed by lightning, risks/strikes, etc.

Solar Panel: 10 years limited product warranty (90% of the minimum rated power output for 10 years. 80% of the minimum rated power output for 25 years.)

Inverter: 10 years international warranty against manufacturing defects.

System Warranty: 2 years full system warranty.

could be earned at present is around Rs.14,000/= Thus the total amount to be received as interest income would be Rs. 168,000/= whilst the aggregate of the electricity bills for 10 years would be Rs.1,440,000/=.

Here the other advantage would be the availability of the amount deposited in the bank to any credit, even after the expiry of the 10 years period.

However, there is no assurance to the fact that the electricity bills would not be increased further and the interest paid by the bank would remain static without reduction during this long period of time.

Capability of the contractor (Solar) to survive in the solar industry within the duration of the warranty period.



**H D Caldera**  
Retired Banker  
Solar User



# Opportunities and Challenge of the Solar Industry of Sri Lanka.

Sri Lanka, with its abundant sunshine and tropical climate, possesses enormous potential for solar power generation. However, despite favourable conditions, the country has been slow to embrace solar energy as a significant source of power. This article explores the reasons behind Sri Lanka's lag in solar power development and highlights the challenges it faces in realizing its solar energy potential.


The development of roof-top solar energy generation or 'solar' started many decades ago in Sri Lanka but substantial impact has been seen since 2016, with the introduction of the "Battle for Solar Energy" project. Before Net-metered rooftop PVs were allowed in 2008, solar off-grid systems were introduced by NGO companies that operated in small scale to provide electricity via batteries and solar panels. This system was mostly adopted by people in rural areas where the national electricity supply is limited such as Northern, Eastern and North Central provinces to power houses to cater for their basic electricity requirements. However, the battery system eventually failed drastically because of the limited lifetime of the battery and the high maintenance cost.

Since 2016, surplus energy sent out to the grid was paid. Rooftop solar PV systems became increasingly popular with the introduction of the Net Metering, Net Accounting and Net Plus systems with the initiative of the "Battle for Solar Energy" programme in September 2016. There was a significant growth among domestic solar power users after 2016 with the initiative of "Battle for Solar Energy" programme. Households and industries came to know that the ROI from installing solar panels is high. Loans were provided for solar systems by the state and private banks at a minimal interest, of 4%. With the growth of the market, awareness was enhanced and people got well educated about the benefits of the product.

CEB makes payments in the Net accounting system. The net metering process is different. For example, if the domestic consumption is 300 units, we generate 300 units or above via the panels and make the bill, zero. Then the need for the consumer to pay an electricity bill becomes unnecessary. In the Net accounting system - E.x. Household consumption is 300 units; the roof has provision for 500 units; hence there is a surplus of 200 units every month; which is sold by the household to the CEB.

Rooftop solar PV installations can significantly reduce the land use and environmental concerns, particularly in urban and suburban areas with the availability of rooftop spaces as it rules out the need to install in vast areas of lands. There were 93.7 MW of rooftop solar PV systems connected to the national grid by end-2017, and the total grid-connected solar PV capacity was targeted to reach 200 MW by 2020. Solar PV development in Sri Lanka has been gaining momentum with the decreasing technology costs and global trends in the improvement of solar PV technology, but the momentum has been somewhat slowing down.





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Currently the solar industry in the country use; off-grid, on-grid and hybrid systems. Hybrid and off-grid systems became popular after 2020 due to the imposing of drastic power cuts. Moreover, people were unable to use generators due to escalating fuel prices. Though these systems existed in the world since 2014/ 2015, Sri Lankan businessmen, households or the government were not inclined to adopt it for various reasons. However, the fuel crisis and continuous power cuts propelled the adoption of these methods.

Up till 2021, Hybrid Inverters were not allowed in Sri Lanka and mainly On-Grid or Grid-Tied solar inverters were deployed in the country. Therefore, the concept of Solar Self-Consumption (SSC) or ‘Solar + Storage’ became a viable option towards mid-2021. However, hybrid systems with Li-ion battery storage, which is necessary for SSC, cost considerably more in comparison to on-grid systems. Therefore, hybrid deployments did not happen as expected, since their introduction in Sri Lanka.

The energy crisis faced since early 2022 has changed the situation drastically and electricity consumers were looking for hybrid or off-grid systems with battery storage, mainly as a solution for long power cuts. Even though such systems are in great demand, only a selected few can afford the right solution with

Li-ion batteries which allows Solar Self-Consumption (SSC) capabilities, due to high capital cost.

In addition, Li-ion batteries and Inverters are not considered as essential items by the Government of Sri Lanka (GoSL). Therefore, the consumers were unable to import batteries and inverters as they were restricted items. In some situations, the payment for the solar system was made in foreign currency (US\$) by the family and friends living overseas for their loved ones in Sri Lanka. Even so, the solar system providers were unable to utilize such funds to import essential components i.e Inverters and Batteries.

However, since the power cuts have been lifted, now the trend is shifted towards On-grid. The heaviness of the electricity bill is a reason.

In our country, tax concessions were offered by the government to the Solar power industry to increase usage. Small companies entering the industry stimulated the bargaining power of consumers. However, only the big companies had the ability to have buffer stocks of solar panels and inverters to provide continuous long-term services to consumers. Thus, evolving with the advancement of technology was a question for small scale companies, infrastructure being the main limitation.

## Factors Customers Should Consider When Installing a Household Solar System

Current electricity consumption of the household and a forecast of future consumption is needed. Also, since this is a long-term investment, the service provider should ideally be a diversified company having the stability to survive for about 25 years (since technology evolves rapidly, mushroom companies cannot survive long-term).



## Challenges in the Solar Industry in Sri Lanka:

### Policy and Regulatory Framework:

One of the primary challenges in Sri Lanka's solar industry is the absence of a comprehensive and stable policy and regulatory framework. Inconsistent policies, complex permitting procedures, and lengthy approval processes hinder the smooth implementation of solar projects. Developing clear and supportive policies that provide long-term incentives and facilitate streamlined procedures will encourage investment and growth in the solar sector.

### Financing and Investment:

Access to affordable financing is crucial for the expansion of the solar industry in Sri Lanka. Lack of access to capital and high upfront costs deter potential investors and individuals from adopting solar energy systems. Establishing financial mechanisms such as low-interest loans, grants, and tax incentives specifically tailored for solar projects will encourage investment and drive industry growth.

### Grid Integration and Stability:

Integrating large-scale solar power into the national grid poses technical challenges. The intermittent nature of solar energy requires the implementation of grid management systems and energy storage solutions to ensure a stable and reliable power supply.



## Future Trends in the Solar Industry in Sri Lanka:

### Scaling Up Utility-Scale Solar Projects:

As the solar industry in Sri Lanka matures, there is potential for large-scale solar projects to meet the country's growing energy demands. Utility-scale solar installations can contribute significantly to the national energy mix, reduce reliance on fossil fuels, and promote sustainable development.

### Energy Storage Solutions:

Advancements in energy storage technologies, such as battery systems, will play a vital role in overcoming the intermittent nature of solar power. The integration of energy storage solutions into Hotels and resorts can enable excess energy storage during peak production periods for use during low-production periods, ensuring a stable and reliable power supply.

### Rooftop Solar Installations:

The future of the solar industry in Sri Lanka will likely see a surge in rooftop solar installations. Encouraging residential, commercial, and industrial sectors to install solar panels on their rooftops can promote energy self-sufficiency, reduce electricity bills, and contribute to overall energy conservation.

### Solar-Powered Agriculture:

Sri Lanka's agricultural sector can benefit from solar-powered irrigation systems, providing a sustainable and reliable source of energy for water pumps. Integrating solar energy into the agricultural sector can reduce dependence on traditional fossil fuel-powered systems, lower operational costs, and improve productivity.



**Rumesh Jayasekara**

Marketing Manager

St. Anthony's Hardware (Pvt) Ltd



# Top-of-the-mind Reputation of Mackson Solar

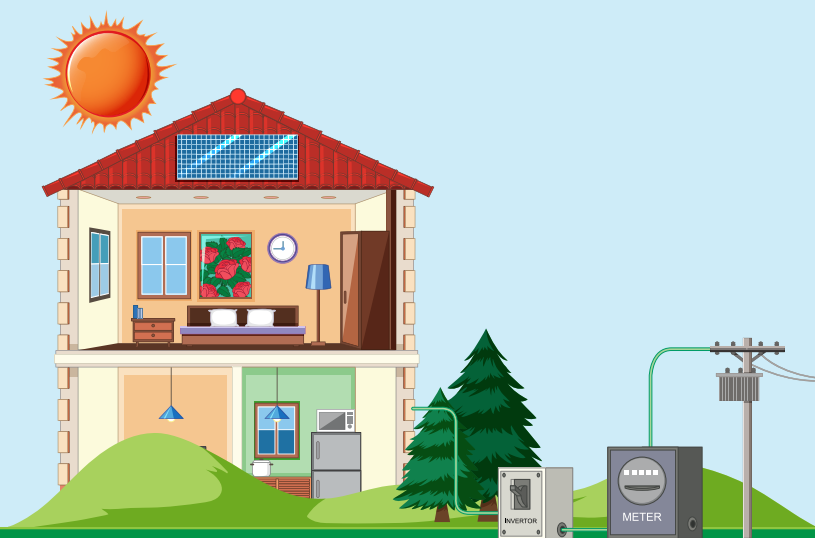
Solar electricity market in Sri Lanka is rapidly developing, escalating electricity bills being the main reason for this upsurge in demand.

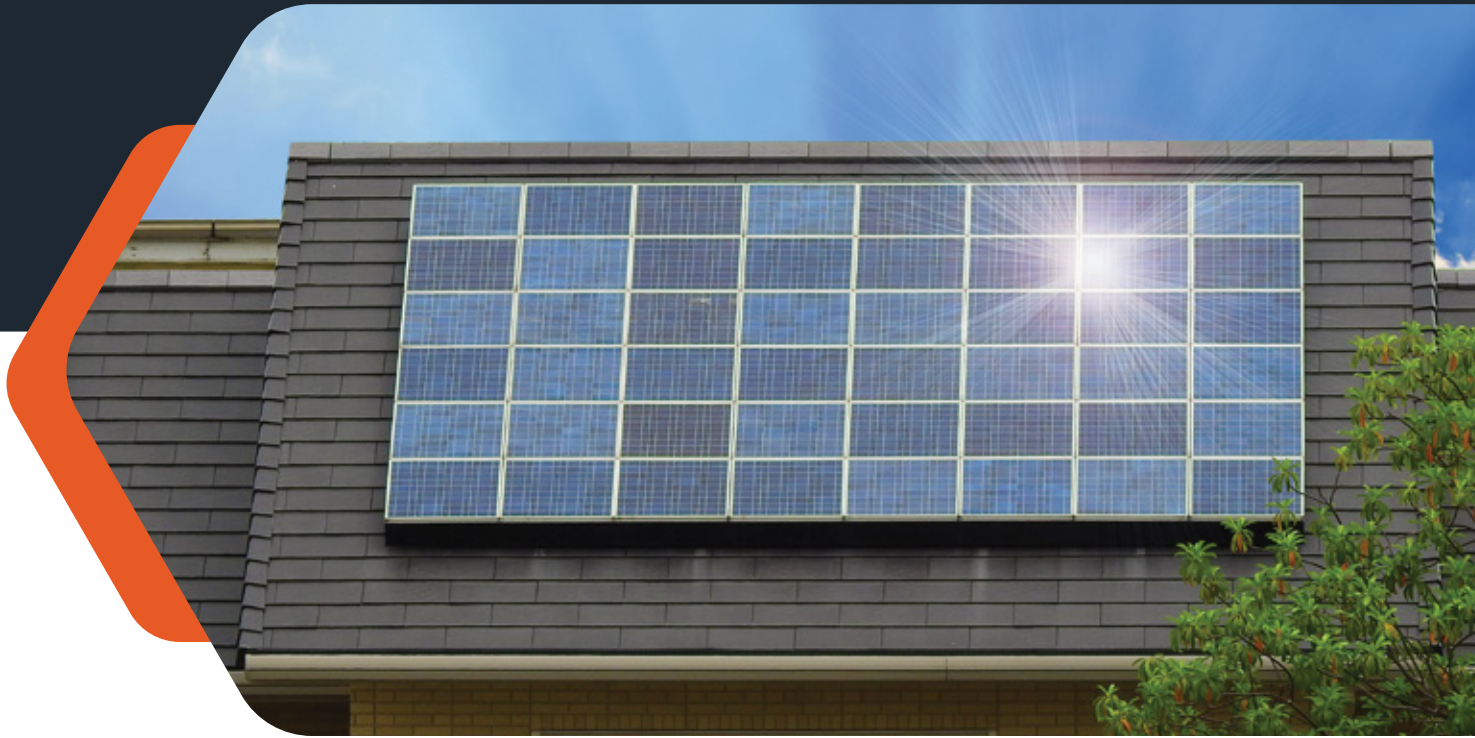
A household who paid a monthly electricity bill of LKR 6000 to 7000 now receives a bill amounting to approximately LKR 18,000. The middle-class populace got a detrimental impact and most of them cannot afford having solar systems. Moreover, rising Dollar rate hampers the process of importing equipment. Consumers cannot reap the benefit of the government's Tax concessions because of the increasing dollar rate. Rupee devaluation has worsened the situation. A consumer has to spend LKR 113,000 to 114,000 to obtain a 5 KW solar product which was LKR 700,000 or 800,000 earlier.

Any importer has to register with the Sustainable Energy Authority (SEA) to be eligible to import products. SEA did a great job as the regulator at the inception. To meet the increasing demand for solar, suppliers were mushrooming at a time. SEA imposed rules and regulations to maintain the quality of suppliers. Then there was a disproportion between supply and demand and this situation once again

shed light on mushrooming suppliers who provided inferior quality products. Last year saw the emergence of 365 new companies to provide solar systems. Mackson Solar Company was registered in 2013 and commenced operations in 2015. "Our company provide products with warranty for manufacturing defects. Panels and inverters are of good quality and brands brought from China. However, consumers who know about industrial products would look for the reputation of the supplier and the panel, inverters, brands being offered. An average consumer usually considers the price on top of everything."

Customers should rely on a reputed company to obtain solar systems. Under the 'Soorya Bala Sangramaya' project, the government offered loans at low interest rates which was 4% for solar systems. A fund from the Asian Development Bank facilitated this. But only the people who deal regularly with banks in urban areas got the awareness and derived the benefit. Since the ROI from solar was long-term, household demand initially dropped. Excessive electricity generated via solar beyond consumption of a particular household or business premises could





be sold to the CEB. Hence you can earn an additional income by selling excess units. The government increased and made the unit-price to the grid as Rs 37 to entice prospective customers for solar.

“Customers must bear in mind to transact with reputed companies to obtain solar sets, because it requires long term relationships. A customer should never purchase an inferior quality solar set from a mushroom company for a lesser price. A company should also not neglect any of its customers after 10 years or so because we deal with products having 20 to 25 years’ warranty. Hence the seller should survive long-term to service that product. We test our products at one of our own companies or at the residence of our Managing Director or the Chairman. That is

our dedication and passion towards servicing customers. With our solar sets, we mostly cater to households. Our policy is to save time and earn quick money by taking up relatively small projects up to 100 KW. These projects require lesser time to complete and they are basically the domestic projects.”

At present, there are limitations in infrastructure and processes. Obtaining approval from CEB is a long process for households. The government should involve more to enhance the capacities of existing transformers to facilitate the solar projects for households. For example, in an area like Barttaramulla, the transformers are being utilized to their fullest capacity at present. Hence, if households look for installing solar sets in this area, CEB will have to change or upgrade all transformers in the vicinity to facilitate the process, which requires a long period of time and cumbersome processes. Since it is an integrated program, even the need for obtaining cabinet approval may arise. However, LECO has lesser processes. If you request for a 5 KW transformer from LECO today, within the very next day you may get 99% approval.



However, marketing oriented suppliers now obtain government approvals on behalf of their customers. Since we have made rapport with respective CEB officials, it is much easier for us to undergo the processes to obtain approvals than laymen. CEB however should simplify its processes for the benefit of the end-user. Enhancing solar business will strengthen the economy of the country. Dollars spent for Fossil fuels can be saved and GDP augmented. Most countries have adopted renewable energy and we must follow suit which will save dollars and enhance the national grid. Barriers have to be lifted and concessions provided by the government to enhance this process.

People have awareness towards the product now. Even Facebook groups have been formed for solar. People compare quotations, companies, brands before purchasing. But some purchase low priced inferior quality products from small companies with no reputation and put themselves into great risk. There are instances of bursting of batteries and products catching fire due to overcharging. The consumer is responsible for taking risks with the product they purchase.

There are two kinds of inverters; Micro inverters and String inverters. Micro inverter can individually connect with even 10 panels. If one panel gets damaged, others will function. If we use String inverter, if one panel is damaged, the whole set of panels will

drop. Our company sell both inverters. The price of Micro inverter is higher, offering customers with two options. We offer manufacturing warranty and performance warranty. For the panels, manufacturing warranty is for 12 years. (One to one replacement). Performance warranty is for 25 years. A standard string inverter comes with a 07-year warranty whereas micro inverter has a 12-year warranty. A company should constantly have buffer stocks for replacement purposes. Only a stable and reputed company can afford to do so. This is where the mushroom companies fail.

In addition to the domestic market, there is a demand for this product from Temples and Churches. Actually for this industry, creating demand is not a problem, the only limitation being people not having finances to adapt to the system. An all-encompassing loan scheme may persuade households to adapt to solar. Demand at present is concentrated within Colombo and the western province. In rural areas the demand is less.

The future of the solar market is bright. Solar technologies will develop further. A significant number of solar products are manufactured in China adhering to their weather conditions. They export a portion of it to other countries including Sri Lanka, obtain feedback and enhance and add value to their solar systems.



**Damith H. Dedigamuwa**

Manager - Group Sales  
Macksons Holdings



**Dasun Harshana**

Sales Engineer  
Macksons Holdings



# Versells Lanka to Fore with Solar Electric Fences

Versells Lanka (Pvt) Ltd was commissioned in 2020. Our core objective was to offer cultivators electric-fences to protect their crops from wild animals. We offer them with the know-how, technical knowledge, advice to operate the electric fences and also equipment needed. Though our company was formed three years back, we were operating in the field for around 12 years as a specialized team.

Solar power fence energizers' are used for electric fences. These energizers have diverse capacities. Usually, for small-scale lands and entrepreneurs we provide energizers with inbuilt solar panels. This category of products has energizers with lesser output joules. Thus these energizers are ideal for relatively small lands with an extent of two or three acres. The energizer has an inbuilt solar panel and a battery. It charges in the daytime and farmers can use it at night. In areas occupying larger lands, we use energizers having solar panels with higher output energy joules. The energizer category with inbuilt solar panel is a Chinese product. We offer a One-year warranty for this product. Energizers rang-

ing from 2J to 25 J are made in Turkey and they come with a Two-year warranty. Installation and maintenance are done by our company. Versells Lanka (Pvt) Ltd is situated at Mahawa, Kurunegala. We provide swift services to all parts in the island. Electric fences used to keep the elephants at bay are mostly installed in the dry zone.

In addition, solar electricity fences are used to keep away rodents, wild boar, monkeys and especially in the wet zone, it is done to prevent rodents and wild boar entering the fields and harming the crops. The vertical electric fence (hanging fence) is more effective in preventing elephants creeping into crop fields. It is very popular in countries like Africa and India. The horizontal fence has an effectiveness only around 50% to 60% because elephants can damage and make it inactive. Vertical one cannot be damaged and it is 95% effective. Mechanism of vertical fence: A horizontal string is fixed at a height of 12 feet and from that, vertical strings are dangled. In the case of horizontal electric fence, elephants hit it with trees and make it inactive but that cannot be done with the vertical fence with hanging strings.



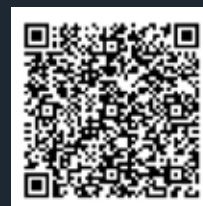
Electricity generated from electric fences is not hazardous thus it won't take the life of an animal or a human. Though the Voltage is at a higher level, its amperage of the output is kept at a very low level or zero. Within one second, the power is emitted from an 'elephant fence' only once and it will remain active for less than one second. (stays for 200 milliseconds).

An 80 ampere battery is embedded in the solar system used for electric fences (for small crop fields). Once charged (for eight hours), it can be kept active at nighttime for 4 to 5 days. In areas that experience constant rain, batteries with higher amperage can be used. These energizers have international standard certification thus their authenticity is high.



**I B S Aruna Kumara**

Managing Director  
Versells Lanka (Pvt) Ltd



# MAS Intimates Adheres to the Triple Bottom-line with Solar

At MAS Intimates, National Grid electricity and diesel for backup generators were primarily used as power sources prior to the adoption of solar power. The overall emissions from the company's operations have been reduced by incorporating the renewable energy source, solar, showing the company's commitment towards emission reduction.

Solar reduces electricity-related emissions, is readily available throughout the year, offers favorable payback and low maintenance, and boosts marketing opportunities. Favorable payback periods and lower electricity costs (initially anticipated) will help the company expand their revenue.

The reliability and reputation of the suppliers, product quality and performance, warranty periods, previous installations, technical staff and capabilities, after sales/maintenance availability, and flexibility were the factors taken into consideration by the company prior to the installation of solar while the country of the supplier was not a hindrance.



The total electricity consumption of the company is around 54,383,364 kWh and solar generation was 16% in 2022. The only drawbacks of adopting solar power are the high capital investment and the inability to be used as an independent power source without battery backup which further increases the investment.

MAS is also thinking long-term and looking at closing the loop of the solar energy cycle by identifying and studying environmentally friendly approaches to dispose and recycle solar panels at the latter stage of their extensive lifecycle. Off-site solar, hybrid systems (solar, grid electricity, backup generators) are in store for the future.

**Energy & Emissions team**  
Environmental Sustainability  
MAS Intimates Pvt Ltd



# Jetwing Group Becomes an Early Adopter of Solar

## What was the Reason for Jetwing to Adopt Solar?

In Sri Lanka were the early adopters of solar energy. In 2011 Jetwing Group made plans to make the carbon footprint, zero within the group. At the time our two oldest hotels, Jetwing Blue and Jetwing Sea were under renovation and we were thinking of bringing innovations to the project. Thus we thought of introducing green energy to these two hotels.

Solar installations were not taking place at the time in the country on industry level. The Net Metering Concept now done by the CEB was not in place at the time, hence no one could generate electricity with solar and give excess units to the national grid.

Yet we had the capability to generate electricity for our own consumption. We thought of ways to create awareness among our clients of this initiative. Instead of explaining about the product verbally, we wanted our guests to experience and feel the difference. The best way to do that was to provide solar electricity to the rooms of those two hotels. Since the hotels were being refurbished, we could easily make the lighting system of the rooms to have solar energy.

First we did it at Jetwing Blue. A system of 20 KW was needed. We installed an indicator inside every room that indicated rooms are illuminated by solar energy.

This tactic created the expected hype for the product. Guests who gather at the restaurant started enquiring about it and we got our engineer to connect with them. We even took the enthusiastic guests to show the solar panels and they started switching off unnecessary lights to save electricity. Moreover, it became one of the key activities for our room boy to explain the guests about using solar electricity for the hotel rooms.

Thus awareness among the guests was created. Though with 20 KW much couldn't be done, the word-of-mouth created positive vibes. Since the foreigners were familiar with solar energy technology, they appreciated our initiative. Success of the solar project at Jetwing Blue prompted us to continue with it at Jetwing Sea with a 15 KW system. In 2013 we installed solar at Jetwing Lagoon too.

In 2014 CEB introduced the Net metering system which offered the privilege for the consumers to sell excess units to the national grid. In the latter part of 2013, Jetwing Yala was under construction. The demand of the hotel was approximately 1 MW. Since, we couldn't afford to install 1MW solar system, we decided to settle for a 300 KW system. That was the largest installation at a private company in the country at the time and we marketed it well. As of today,



this system generates about 38000 KWH within a month. For the hotels, CEB billing method is on, 'time of used' category that makes the rates differ between daytime and nighttime until dawn. Within the hotel, 46% electricity is generated via solar for the daytime demand. Solar energy covers 26% of the total electricity bill of the hotel.

As of today, we have fully recovered the break-even of our solar investment. While installing, the most important factors were selecting the solar panel and the inverter. We had two options; Chinese brands and European brands. We selected the European brands. Since there is ample sunlight these days, we generate around 1500 kWh from Jetwing Yala plant. We planned 'Jetwing Lake' in Dambulla in 2015. By that time solar technology had become more advanced and efficiency was enhanced. We did a study to determine the additional features we should incorporate into Jetwing Lake solar project. By this time, we knew we could derive higher yield from European products.

We encountered a supplier who brings down 'solar bifacial panels'. The common solar panel generates electricity when the top side of the panel gets sunlight. Bi-facial panel in contrast generates electricity even from the bottom side, provided a source of light is emitted from below. For this purpose, the floor area has to be in white colour. Luckily we were in Dambulla, an area where the dolomite industry is flourishing. We collected a bulk of dolomite off-cuts and laid it on the floor of the place selected for solar power generation and installed bi-facial panels above as the rooftop. The available light that was reflected from the white colour dolomite floor hit the lower parts of the bi-focal solar panels, and triggered generating electricity.

This exercise was successful and it provided us with an extra yield of 15%. We've installed 182kW of Bi-facial panels at Jetwing Lake.

As mentioned earlier, Jetwing Group strives to make the carbon footprint, zero within the group. Out of the total electricity requirement at Jetwing Yala hotel, 58% is derived from renewable sources. These sources are; firewood boiler, bio-gas and solar. Jetwing Lake hotel at present derives around 70% of its electricity requirement from solar. Energy demand in Jetwing Yala is higher than that of Jetwing Lake. The reason being, at Yala, fresh water is made from sea water and this demands additional energy. Our plan is deriving the total need of fresh water by purifying sea water and this requires excessive amount of electricity that could only be generated via solar.

In 2016, a delegation from the International Financial Company (IFC) visited Sri Lanka. They came to study the potential capacity of large business chains as Jetwing. They had a shortlisting process from which our company was shortlisted for the study. They visited every property owned by the Jetwing Group, studied our fullest potential and did a comprehensive report. According to this report it was revealed, within the group there was a potential capacity for 1.2 MW additional solar. Though the expense was high, we developed this study further and found, that there was a potential for 1.5 MW. To enhance infrastructure to have this additional solar energy, we needed more equipment and currently we are in the process of calling quotations for that. We anticipate to enhance the capacity to achieve 80% of the total energy is from solar energy within the group by the end of this year.

	Generation (kWh/month)	Contribution to Day-time Electricity Requirement	Contribution to Daily Electricity Requirement
Jetwing Yala	38,486	46 %	26 %
Jetwing Lake	39,250	58 %	35 %

## Solar PV Capacities Proposed & Their Estimated Energy Generations Across Group Hotels.

	Estimated Capacity (kWp)	Est. Electricity Generation (kWh / month)
Jetwing Ayurveda Pavillions	20	2,400
Jetwing Beach	250	30,000
Jetwing Blue	330	39,600
Jetwing Kaduruketha	126	15,120
Jetwing Lagoon	270	32,400
Jetwing Lighthouse	75	9,000
Jetwing Sea	140	16,800
Jetwing St.Andrews	60	5,400
Jetwing Surf	144	17,280
Jetwing Vil Uyana	15	1,800
Jetwing Yala	125	15,000



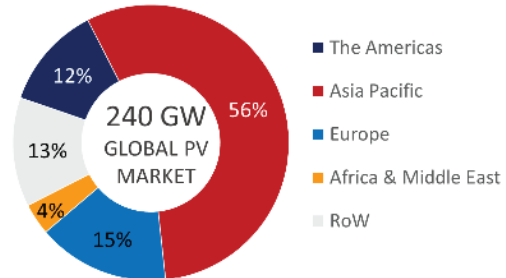
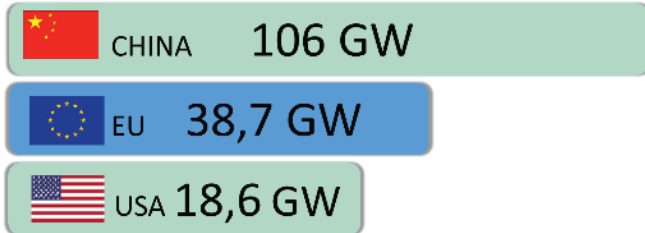
**Lahiru Munasinghe**  
Head of Engineering  
Jetwing Hotels Ltd

**Jetwing**  
HOTELS  
SRI LANKA

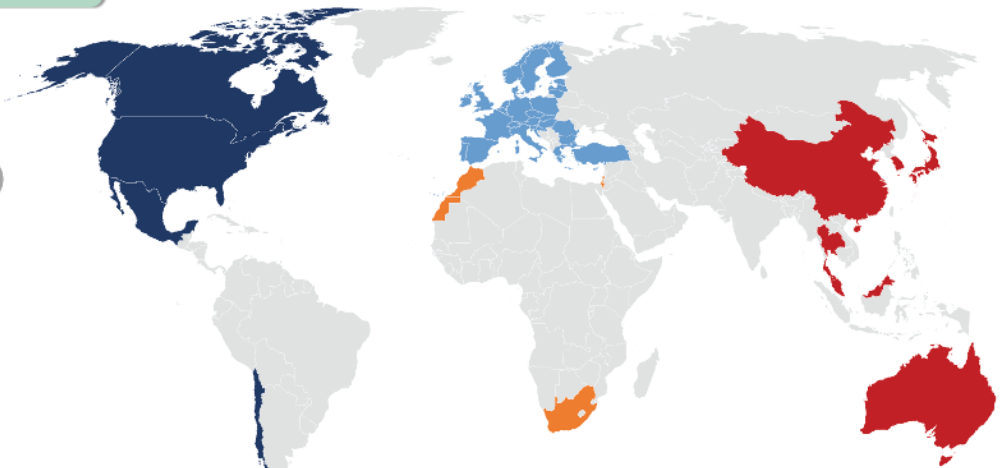


# Global PV Markets

## TOP PV MARKETS 2022

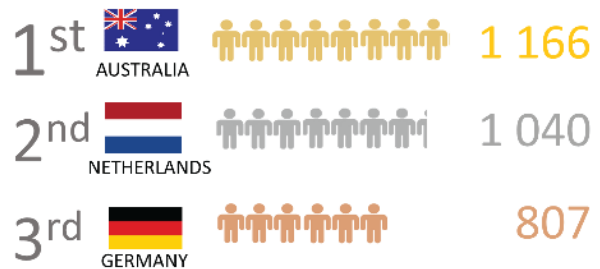


1 399 Mt  
CO<sub>2</sub> emissions  
avoided in 2022

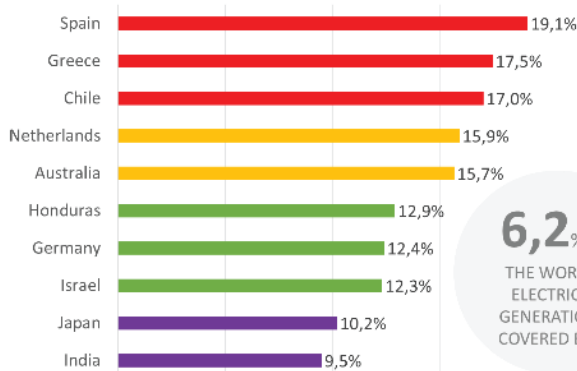


- # 1185 GW were installed all over the world by the end of 2022
- # China is the world's #1 PV market
- # 23 countries installed at least 1 GW of PV in 2022
- # 16 countries have installed at least 10 GW of cumulative capacity at the end of 2022

## SOLAR PV PER CAPITA 2022 Watt/capita

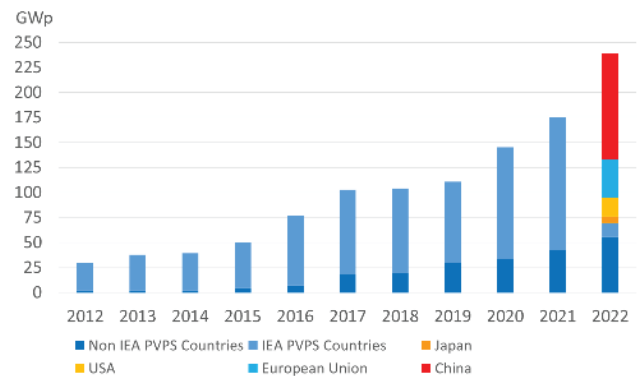


## COUNTRIES WITH HIGHEST PV PENETRATION



6,2% OF  
THE WORLD'S  
ELECTRICITY  
GENERATION IS  
COVERED BY PV

## EVOLUTION OF ANNUAL PV INSTALLATIONS



Source: International Energy Agency



INDIA



## Solar and Wind Dominate India's Power Capacity Growth In 2022

India saw a strong growth in renewable energy sources (RES) capacity installations in 2022, setting the stage for the country to assume climate leadership in the run up to the year's G20 summit. Solar and wind dominated India's power generation capacity growth in 2022, accounting for 92% of total capacity additions. Coal accounted for only 5%.

While India's coal capacity additions in 2022 dropped significantly in comparison to the previous year, solar and wind capacity additions increased. Combined, solar and wind added 15.7 GW of new generation capacity in 2022, an addition of 17% than in

2021. Coal added less than 1 GW, showing a 78% decrease in additions in comparison to 2021. India added 13.9 GW of solar capacity in just one year, comparable to the UK's entire solar capacity in 2021.

Growth in solar and wind capacity is expected to be concentrated in Rajasthan and Gujarat, the states that have ambitious targets for 2030. Rajasthan and Gujarat together account for one third of India's total RES capacity target of 450 GW, most of which are solar and wind.

CHINA



## China - Renewables as the Primary Future Source of Energy

Renewables should be the preferred route for power generation, and in China renewable power would become the backbone of the power supply, making solar power, wind power and hydropower the dominant generation sources.

The role of solar and wind in China's power system has been on the rise and often has been world-leading in recent years. This trend will accelerate towards 2050, with the majority of electricity capacity and generation in China coming from solar and wind.

"With a sun hat made of solar panels, a tea-picking robot weaves through rows of renowned Longjing tea bushes in Hangzhou's West Lake scenic spot, east

China's Zhejiang Province, with its agile manipulators and caterpillar wheels. The 550-kg robot picker is a godsend for local tea planters".

While mature renewable technologies require accelerated scale-up, there is also significant potential in China for some emerging renewable technologies. Offshore wind (with either bottom-fixed or floating foundations) could play a significant role in the country, with offshore wind farms located close to coastal urban areas reducing the need for transmission from remote regions. China has become the global leader in offshore wind, with nearly 17 GW of capacity installed in 2021, according to the Chinese National Energy Administration (NEA, 2022).





# Singapore Will Quadruple Solar Energy Developments by 2030

Singapore intend to green its energy-mix to ensure a stable and reliable electricity supply. One aspect of the country's efforts to reset its energy supply to be more energy sustainable, is to quadruple the number of solar energy deployments: 1.5 GW- peak by 2025 and 2.0 GW- peak by 2030. Less than 1% of electricity is currently generated by solar panels and the aim is to increase it to 3% by 2030.

Since Singapore does not have access to hydro and wind power and is located on the equator, solar is the most viable source of renewable energy. However, land constraints and local weather conditions are challenges to develop solar on a large scale. Due to

lack of land area, Singapore increase use of solar panels in two ways: On roof tops of commercial / industrial buildings, on 7,000 government housing blocks and on reservoirs. Solar panels on reservoirs are being designed and installed as part of a floating solar farm (each floating farm is around the size of 50 soccer fields) ranging from 60 – 80 MW- peaks capacity to generate and supply electricity from offshore. Singapore's installed solar capacity being 203 MWp in 2018 was increased to 350 MWp by 2020. It was enhanced to 1 GWp beyond 2020 equivalent to powering about 210,000 4-room HDB dwellings. Plans are being made to reach one gigawatt-peak solar deployment.



# Solar Energy Generation in United Arab Emirates (UAE)

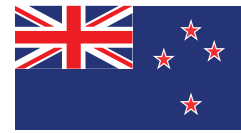
Between the forecast period 2020 to 2025, UAE's solar energy market is assumed to hit a record of more than 15% compound annual growth rate.

The main drivers of this growth are government policies, incentives and tax credits. In addition to that, the constant dropping of solar system costs also helps in encouraging people switch to solar power for either residential or commercial purposes. However, according to the forecast, the high cost of solar installation, equipment maintenance such as the cleaning cost of solar panels and the limited power supply may affect and restrain the solar market growth.

## UAE Solar PV Segment Growth

According to the Rystad Energy report, the total capacity of installed renewable resources in the United Arab Emirates in 2020 reached 2.3 gigawatts (GW) and the solar photovoltaic (PV) projects comprised 91% of the total installed renewable capacity. This huge share of solar power was expected to soar high in 2022. Also, Rystad Energy has forecasted that by the end of 2025, the total renewable capacity of UAE will reach 9 GW, whereas solar PV capacity alone is expected to gain 8.5 GW by the end of 2025. This impressive increase in capacity will help diversifying UAE's energy mix. Alternatively, the total energy shares of the United Arab Emirates in its power generation mix is expected to increase from 7% in 2020 to 21% in 2030, and to 44% by 2050.





## New Zealand Solar Energy Market Trends (Utility Sector to Witness a Significant Growth):

Solar energy presents a major opportunity for growth in supplying renewable electricity to the New Zealand market to meet New Zealand's 100% renewable electricity target. The Electricity Authority (EMA) reports that New Zealand currently has around 160 MW of installed grid connected solar power, representing only 0.5% of New Zealand's total electricity supply.

- The New Zealand solar energy market is expected to have the utility sector as its dominant segment due to the declining cost of solar generation technology and numerous upcoming solar power projects during the forecast period.
- In New Zealand, the utility segment of the solar energy market has grown a lot in the last few years. In 2021, the installed solar capacity reached approximately 146 MW, recording an increase of 20% com-

pared to the 146 MW in 2020. Most of this solar generation is from utility-scale solar power plants.

- The government has set an ambitious target of increasing the share of renewable energy from 80% to 90% in 2025 and to 95% in 2035. Such targets would prompt significant investments in the country's solar energy industry in the coming years.
- Plans are underway to construct a number of large-scale solar projects. For instance, in January 2023, Saft, a subsidiary of TotalEnergies, got a contract to establish New Zealand's first big grid-connected battery, which is worth \$NZ186 million.
- Based on the above factors, the utility sector is likely to see significant growth in the solar energy market during the forecast period.



## The Australian Renewable Energy Industry Powered on in 2021, Adding a Record Amount of New Capacity

The Australian renewable energy industry accounted for 32.5 per cent of Australia's total electricity generation in 2021, which represented an increase of almost 5 percentage points compared to 2020. The growth in renewable energy generation was most keenly felt in the coal sector, which saw its share of total generation fall from 62.0 percent in 2020 to 59.1 percent in 2021. The gas sector also saw a notable fall, with its proportion of total generation falling to 7.7 per cent in 2021, down from 9.9 per cent in 2020.

The growth of renewable energy in Australia in 2021 was again led by small-scale solar. The sector added 3.3 GW of new capacity during the year, representing the fifth year in a row that it has set a record for new installed capacity. The large-scale sector also had a bumper year in 2021, adding 2955 MW of new capacity across 27 projects, which was almost 1 GW more than that added in 2020.







# SLIM RESEARCH BUREAU

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SLIM Research Bureau  
#94, Ananda Rajakaruna Mawatha, Colombo 10  
☎ +94 11 267 5000 | 🌐 [www.srb.lk](http://www.srb.lk)

Consult our insight team now!  
☎ +94 70 366 3993  
✉ [srb@slim.lk](mailto:srb@slim.lk)